

THIS REPORT HAS BEEN DELIMITED  
AND CLEARED FOR PUBLIC RELEASE  
UNDER DOD DIRECTIVE 5200.20 AND  
NO RESTRICTIONS ARE IMPOSED UPON  
ITS USE AND DISCLOSURE.

DISTRIBUTION STATEMENT A

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION UNLIMITED.

# Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy WHEN IT HAS SERVED YOUR PURPOSE so that it may be made available to other requesters. Your cooperation will be appreciated.

# AD

# 41469

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

Reproduced by

DOCUMENT SERVICE CENTER

KNOTT BUILDING, DAYTON, 2, OHIO

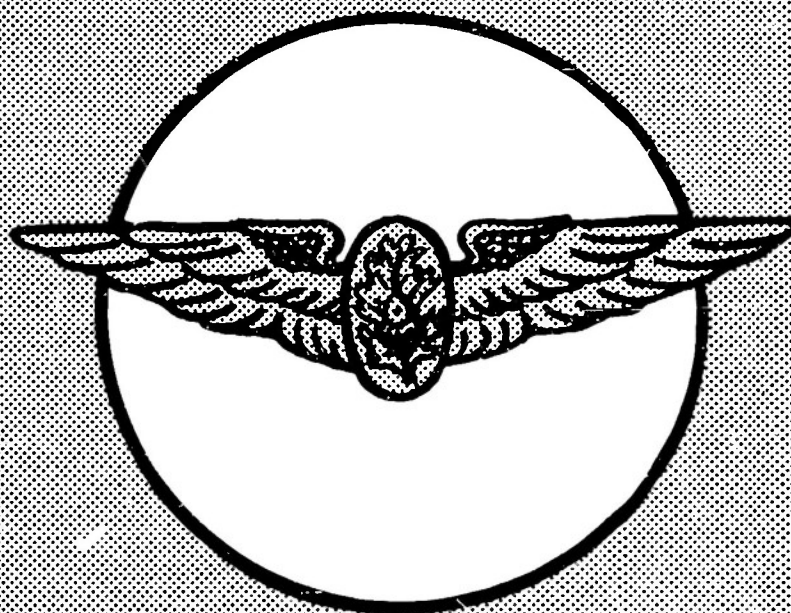
# UNCLASSIFIED

69714 41469  
copy



VOCAL RESPONSES BEFORE MICROPHONES

PROJECT REPORT NO. NM 001 064.01.24



# RESEARCH REPORT

OF THE

**U. S. NAVAL SCHOOL OF AVIATION MEDICINE**

NAVAL AIR STATION

PENSACOLA FLORIDA

U. S. NAVAL SCHOOL OF AVIATION MEDICINE  
NAVAL AIR STATION  
PENSACOLA, FLORIDA

JOINT PROJECT REPORT NO. 24

The Ohio State University Research Foundation  
Columbus, Ohio, under Contract N6ONR 22525,  
Office of Naval Research Project Designation No. NR 145-993

and

U. S. Naval School of Aviation Medicine  
The Bureau of Medicine and Surgery Project NM 001 064.01.24

VOCAL RESPONSES BEFORE MICROPHONES

Report prepared by

Gilbert C. Tolhurst and John W. Black

Approved by

John W. Black  
Project Director  
and  
Captain Ashton Graybiel, MC, USN  
Director of Research  
U. S. Naval School of Aviation Medicine

Released by

Captain Julius C. Early, MC, USN  
Commanding Officer

15 July 1954

## SUMMARY

Side-tone and environmental noise are presumably the principal determinants of a speaker's sound pressure level. Other experience on the part of the speaker would be expected to contribute also. In the present exploratory studies the presence of a microphone was found to cause speakers to raise their level. The effect of this change was not measurable with standard intelligibility tests in quiet.

## INTRODUCTION

"Mike fright" has taken its place alongside stage fright as a phrase describing the frequent failure of a speaker to feel poised and at ease. The notion is widespread that behavioral differences in speaking occur as a speaker faces a microphone.

Preliminary studies have been undertaken to find whether the presence and position of a microphone itself alters vocal performance. Such effects would be apart from alterations in speech attributable to the side-tone, provided by a microphone-amplifier-earphone (or loudspeaker) system. For example, Mr. Victor Subrizi, after accounting for the effects of various circumstances of side-tone level and S/N ratios in telephone talking, noted:

"Moreover, some reaction prompts the average subscriber to raise his talking volume about  $1\frac{1}{2}$  db for every 1,000 air mile increase in the length of his call." (2)

The present studies treated the questions, (a) Does the presence of a microphone affect the sound pressure level of speech? (b) Does the presence of a microphone affect the intelligibility of a speaker? Does the position of a microphone affect the sound pressure level of a speaker?

## PROCEDURE

Two groups of Naval Air Cadets served as experimental subjects. Group 1, comprised of 32 members (Ss), individually read intelligibility tests lists, Form A, under the following circumstances (1): sound-treated room; S seated with his head against a headrest; a microphone, concealed by a screen, 12 inches from the headrest; a power level recorder (Sound Apparatus Co.) fed by the concealed microphone and located in an adjacent room.

The experimenter (E), in the room with S, said, "I am trying to match microphones with voices. First, I want you to read one speaker list of this material that we call Form A naturally to me; now, another list," E was four feet and eight feet from S during the reading of the two lists, the order of conditions rotating from one S to another. "I believe I have the microphone for you. Please read List 3." This continued through Lists 4, 5, and 6 as E placed the microphone at one foot, two feet, three feet, and four feet from S. The order of conditions was rotated among the Ss.

Also the readings to E and "to the microphones" were rotated in order.\*

Group 2 was comprised of 14<sup>1</sup>/<sub>2</sub> members who, in panels of 12 speakers, read the speaker lists of Forms A and B of the multiple-choice intelligibility tests. Panels of listeners sat in tablet-arm chairs spaced at 4-foot intervals, backed against a wall, in a corridor 8<sup>1</sup>/<sub>2</sub> feet x 8<sup>1</sup>/<sub>2</sub> inches x 100 inches. The nearest listener was 20 feet from the speaker's position. Speaking and listening occurred in quiet. Each speaker read one list with a microphone 18 inches in front of him and another list with no microphone present. The order of conditions was rotated among the speakers.

### RESULTS

Group 1 read to E at eight-foot distance with 0.8 db greater sound pressure level than when he was four feet away. This difference was significant at the 5% level of confidence ( $t$ , 2.04; 31 d.f.).

Group 1 read to both E and to the microphone at a distance of four feet. The voice to the microphone was 1.4 db greater in sound pressure level than the voice to E. This difference was significant at the 1% level of confidence ( $t$ , 5.86; 31 d.f.).

Group 1 did not read with different mean sound pressure levels when the microphone was one, two, three, and four feet distant.  $F$  in this instance was 1.10 (3 and 93 d.f.), and the mean relative sound pressure levels were 0.3 db, 0.1 db, 0.0 db, and 0.5 db respectively. A further analysis of variance was performed to determine whether or not an order effect operated among the four microphone conditions (positions). None was observed, the variance attributable to order being less than the error variance.

The difference between the microphone vs. no-microphone intelligibility scores of Group 2 was not statistically significant. The means scores for the two conditions were: microphone, 91.4%; no microphone, 91.2% ( $t$ , 0.27, 143 d.f.).

### DISCUSSION AND SUMMARY

Subrizi's observations that telephone talkers raise their talking levels "with distance" and apart from side-tone suggests that "set" and experience affect the sound pressure level that a speaker sets for himself. A similar mode of reaction apparently leads a speaker to talk with increased level to a listener who is eight feet removed as opposed to the same listener four feet removed. This reaction is readily interpreted as in keeping with experience in talking intelligibly with listeners who are removed by different distances. The further fact, however, that talkers

---

\*Dr. Charles Lightfoot, now at Northwestern University, effected the foregoing procedure.

raise their sound levels in the presence of a microphone is hardly to be attributed to experience. The increment in level, 1.4 db, statistically significant in sound-pressure values, did not affect intelligibility scores under conditions of quiet.

#### REFERENCES

1. Haagen, C. H. Intelligibility Measurement: Twenty-four word multiple-choice tests. New York: Psychological Corp., Sept. 1945. OSRD Rept. no. 5567.
2. Subrizi, Victor. A speech volume survey on telephone message circuits. Bell Telephone Record, 31, 292-295, 1953.

15 July 1954

U. S. Naval School of Aviation Medicine, Pensacola, Florida

Joint Report NM 001 064.01.24

"Vocal Responses Before Microphones"

Gilbert C. Tolhurst and John W. Black, The Ohio State University and Acoustic Laboratory, U. S. Naval School of Aviation Medicine, Pensacola, Florida

3 pp.

UNCLASSIFIED

Thirty-two experimental subjects, under the instruction to talk naturally, read phrases to an experimenter and to a microphone, both at controlled distances from the reader. The speakers altered their sound pressure level in keeping with the 8-foot and 4-foot experimental separation distances between themselves and the listener or microphone. At a single distance the speakers spoke with greater sound pressure level to a microphone than to a listener. The effect of the presence of a microphone on vocal sound pressure level was not measurable on standard intelligibility tests in quiet.

1. Speech Correction and Hearing Problems
2. Acoustics
3. Human Engineering
4. Psychology

- I. Tolhurst, G. C.
- II. Black, John W.
5. U.S. Naval School of Aviation Medicine  
(L. C. Subj. Head.)

U. S. Naval School of Aviation Medicine, Pensacola, Florida

15 July 1954

Joint Report NM 001 064.01.24

"Vocal Responses Before Microphones"

Gilbert C. Tolhurst and John W. Black, The Ohio State University and Acoustic Laboratory, U. S. Naval School of Aviation Medicine, Pensacola, Florida

3 pp.

UNCLASSIFIED

Thirty-two experimental subjects, under the instruction to talk naturally, read phrases to an experimenter and to a microphone, both at controlled distances from the reader. The speakers altered their sound pressure level in keeping with the 8-foot and 4-foot experimental separation distances between themselves and the listener or microphone. At a single distance the speakers spoke with greater sound pressure level to a microphone than to a listener. The effect of the presence of a microphone on vocal sound pressure level was not measurable on standard intelligibility tests in quiet.

1. Speech Correction and Hearing Problems
2. Acoustics
3. Human Engineering
4. Psychology

- I. Tolhurst, G. C.
- II. Black, John W.
5. U.S. Naval School of Aviation Medicine  
(L.C. Subj. Head.)

15 July 1954

U. S. Naval School of Aviation Medicine, Pensacola, Florida

Joint Report NM 001 064.01.24

"Vocal Responses Before Microphones"

Gilbert C. Tolhurst and John W. Black, The Ohio State University and Acoustic Laboratory, U. S. Naval School of Aviation Medicine, Pensacola, Florida

3 pp.

UNCLASSIFIED

Thirty-two experimental subjects, under the instruction to talk naturally, read phrases to an experimenter and to a microphone, both at controlled distances from the reader. The speakers altered their sound pressure level in keeping with the 8-foot and 4-foot experimental separation distances between themselves and the listener or microphone. At a single distance the speakers spoke with greater sound pressure level to a microphone than to a listener. The effect of the presence of a microphone on vocal sound pressure level was not measurable on standard intelligibility tests in quiet.

1. Speech correction and Hearing Problems
2. Acoustics
3. Human Engineering
4. Psychology

- I. Tolhurst, G. C.
- II. Black, John W.
5. U. S. Naval School of Aviation Medicine  
(L. C. Subj. Head.)

U. S. Naval School of Aviation Medicine, Pensacola, Florida

15 July 1954

Joint Report NM 001 064.01.24

"Vocal Responses Before Microphones"

Gilbert C. Tolhurst and John W. Black, The Ohio State University and Acoustic Laboratory, U. S. Naval School of Aviation Medicine, Pensacola, Florida

3 pp.

UNCLASSIFIED

Thirty-two experimental subjects, under the instruction to talk naturally, read phrases to an experimenter and to a microphone, both at controlled distances from the reader. The speakers altered their sound pressure level in keeping with the 8-foot and 4-foot experimental separation distances between themselves and the listener or microphone. At a single distance the speakers spoke with greater sound pressure level to a microphone than to a listener. The effect of the presence of a microphone on vocal sound pressure level was not measurable on standard intelligibility tests in quiet.

1. Speech correction and Hearing Problems
2. Acoustics
3. Human Engineering
4. Psychology

- I. Tolhurst, G. C.
- II. Black, John W.
5. U.S. Naval School of Aviation Medicine  
(L. C. Subj. Head.)

# Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy WHEN IT HAS SERVED YOUR PURPOSE so that it may be made available to other requesters. Your cooperation will be appreciated.

**AD**

**41469**

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

Reproduced by  
**DOCUMENT SERVICE CENTER**  
KNOTT BUILDING, DAYTON, 2, OHIO

**UNCLASSIFIED**